Thesis/
Reports
Pasin,
S.

AN ANALYSIS OF THE EFFECTS OF VARIOUS SILVICULTURAL STANDARDS AND GUIDELINES ON NATIONAL FOREST LANDS WITHIN THE CEDAR RIVER WATERSHED

Prepared by North Bend Ranger District Personnel, Mt. Baker-Snoqualmie National Forest, in cooperation with the City of Seattle Water Department.

941=R-06

Submitted by: Stan Pasin Date 12-14-83
Stan Pasin
District Silviculturist & Team Leader

Reviewed by: Michael F. Cooley Date 12-14-83
Michael F. Cooley
District Ranger

Reviewed by: Joe E. Monahan Date 1/5/84
Joe Monahan
City of Seattle

Property of
National FS Library
USDA Forest Service
240 W Prospect Rd
Fort Collins CO 80526

INDEX

	Page Number
I. INTRODUCTION	1
A. Purpose of this analysis	1
B. Location	1
C. Why the Cedar River Watershed?	1
1. Lack of public use	1
2. Stable soils	2
3. Different wildlife management objectives	2
4. Reforestation success	3
5. History of sustained cutting with acceptable impacts.	3
6. Susceptibility to blowdown	4
II. BACKGROUND	4
A. Ownership patterns	6
B. 1962 Cooperative Agreement highlights	7
C. Cedar-Tolt Environmental Impact Statement	7
D. Distribution of the annual allowable cut	7
E. Silvicultural practices	8
1. Slash treatment	8
2. Size of clearcuts	8
3. Logging systems	9
4. Reforestation	9
F. Washington State Forest Practice Act Standards	9
G. National Forest Management Act of 1976 Standards	9
H. Regional silvicultural Guidelines	10
I. Past impacts on water, soil, and reforestation	11
1. Impacts on water and soils	11
2. Impacts of logging on reforestation	12
J. Management of City exchange lands	13
III. ALTERNATIVES	15

IV. EFFECTS OF IMPLEMENTATION 16

A. Soils and water 16

B. Land exchange 16

C. Timber sales program 16

D. Costs 17
1. Road maintenance costs
2. Logging costs 17
3. Sale preparation costs

V. EVALUATION OF ALTERNATIVES 18

VI. RECOMMENDATIONS 22

VII. APPENDIX 22

A. Map (Figure 1) A1

B. City of Seattle position statement A2

C. Summary of Harvest History within the Cedar River Watershed A3

D. Timber Logged in the Cedar River Watershed 1944-1961 A4

E. Timber Harvested in the Cedar River Watershed 1962-1982 A5

F. Assumptions Used For All Alternatives and Summary of Cutout A6

G. Section by Section and Year by Year Cutout Work Sheets for Alternatives A7

I. INTRODUCTION

A. Purpose of this Analysis

This analysis is being prepared to evaluate several alternatives to the present Regional Silviculture Standards and Guidelines for the Cedar River Watershed. This opportunity exists due to the presence of several unique conditions within the watershed. It is the objective of this analysis to identify the most appropriate guidelines that will achieve the management goals for National Forest lands within the Cedar River Watershed while meeting the City of Seattle's objectives regarding water quality and quantity.

B. Location

The Cedar River Watershed is located in southeast King County, (see Appendix figure 1) approximately 25 miles east of Seattle, near the town of North Bend. To the north is the Snoqualmie Valley and the Interstate 90 highway which crosses the Cascade Mountain Range at Snoqualmie Pass. The Green River Watershed, Tacoma's municipal water supply source, borders on the south. The eastern edge of the watershed is the crest of the Cascade Mountains, while the western border is 24 miles downstream at the Landsburg water supply intake.

C. Why the Cedar River Watershed?

The National Forest lands within the Cedar River Watershed have some unique characteristics generally not found elsewhere in the National Forest System. In addition to the long term management relationship established by the Cedar River Watershed Cooperative Agreement of 1962, some of these principal items are:

1. Lack of Public Use

City of Seattle (hereinafter referred to as the City) and private lands within the watershed are closed to public use and the Forest Service does not own public rights on roads. Boundaries on City and private land are signed accordingly and regular patrols insure that the public is kept out. The effect of this is that the public is excluded from all but a few small areas of National Forest lands along the hydrographic boundary. Because of this, visual quality objectives are much lower than in areas open to the public. Only in a few places along the hydrographic boundary where viewers can look into the watershed are visual management objectives influenced by public viewing.

2. Stable Soils

Unstable soils make up less than one percent of the Cedar River Watershed's soils. 1/ This is a great contrast to National Forest lands north of the Cedar River Watershed.

Soils in the Cedar River Drainage are derived from volcanic bedrock on the sideslopes and from deep deposits of glacial till and drift in the valley bottoms. Dominant are soils of a gravelly sandy loam texture that are well drained and relatively stable.

3. Different Wildlife Management Objectives

The final Environmental Impact Statement for the Cedar-Tolt Watershed Management Plan (hereinafter referred to as the E.I.S.), was completed in 1979. 1/ A provision of the plan was that wildlife populations would fluctuate with available food supplies. These food supplies would, in turn, be directly effected by timber harvest.

None of the big game winter range is located on National Forest lands. Some time in the future, as harvesting occurs in second growth on private lands in the winter range, the wildlife populations are expected to increase to the point where water quality may be degraded. To control big game animal populations a controlled permit hunt, coordinated between the City of Seattle and the Washington State Department of Game, will be considered. Because of the concern for possible water quality degradation from big game and lack of public access, increasing big game populations is not a National Forest objective in the watershed.

Probably because of the combination of the lack of hunting pressure and low exposure to humans, elk and deer are commonly observed throughout the large clearcut areas and they appear to be relatively tame and unconcerned about the presence of humans or vehicles. Because of this, large clearcuts are utilized more than in other areas where use is concentrated only along the edges of hiding cover.

1/ Seattle Water Department, 1979. The Cedar-Tolt Watershed Management Plan, Final Environmental Impact Statement. Unpublished report. Seattle Water Department, Seattle, WA.

4. Reforestation Success

Because of the public closure, the risk of fire occurrence is unusually low. Lightning fire occurrence has also been historically low. Because of these and silvicultural considerations, no broadcast burning of logging slash has been done nor determined to be necessary on any of the lands in the watershed since 1966. 2/ This has contributed to the establishment of well stocked natural stands of primarily residual Pacific silver fir (Abies amabilis Douglas ex Forbes) in the high elevation areas. This, combined with relatively cool, moist, summers influenced by maritime air flow, has resulted in generally high levels of reforestation success on both low and high elevation areas. During the period from 1926 to 1955 planted tree survival averaged around 80% with some years as high as 95%. 3/ More recent planting success on National Forest lands is comparable or somewhat higher.

Strong, warm, dry, east winds typically occur in the fall. These winds cause ripe cones to open and help to disperse seed.

National Forest lands are located above the normal elevational range of red alder (Alnus rubra Bong) and competition from overtopping brush of any species is practically non-existent.

Because of combinations of the above factors, reforestation success is unusually high, even on the 640 acre clearcuts commonly found on private lands. Clearcut areas are typically characterized by overstocked young stands of mixed species thoughout the watershed.

2/ Hellman, Bob; 1983. Personal conversation. City of Seattle Water Department, North Bend, WA.

3/ McWilliams, Mary; 1955. Seattle Water Department History 1854:1954, Dogwood Press, place of publication unknown.

5. History of Sustained Cutting with Acceptable Impacts

For more than 80 years, road construction and clearcut harvesting have been occuring in the Cedar River Watershed. An average of over 60MM bd ft/year has been harvested from clearcut acres/year during this time (see Appendix, page 3).

Throughout this long period of sustained timber harvest activity the watershed has met the drinking water needs of the city of Seattle. Few areas, if any, can show this experienced record.

Since 1945, with the advent of the Cedar River Logging Agreement, the harvest in the watershed has been restricted to the estimated annual sustained allowable cut of 35MM board feet/year. Prior to that time, the rate of harvest varied greatly and exceeded 100 MM board feet/year during some periods.

6. Susceptibility to Blowdown

The eastern half of the Cedar River Watershed in which all of the remaining National Forest timber is situated is particularly susceptible to the occurrence of blowdown. This is due to the east-west orientation of the Cedar River valley which heads at the crest of the Cascade Mountains. Logging activities in this drainage for the past forty years have been focused primarily in private timber situated on alternate sections of land intermingled with National Forest lands.

As the result of this ownership pattern and focus of logging activity, National Forest timber has been subject to extensive exposure and thus to the threat of frequent blowdown. This impact has occurred annually as the result of the seasonably predictable strong easterly winds although storms from the southwest occasionally also cause heavy damage to certain stands.

Assuming all other factors to be the same, such as orientation to wind direction, soil type, soil moisture, and location on slope, the risk of blowdown is proportional to the extent of timber edge. Inasmuch as the extent of timber edge or perimeter is a function of the size of the logging unit or area, the larger the area the lesser the perimeter when compared to a series of smaller units totaling an area equal to that larger unit. For example, one forty acre unit may have one mile of perimeter exposed to blowdown while two twenty acre units may have 1.5 miles of perimeter exposed to blowdown. Thus larger units reduce the risk of blowdown and with the propensity for blowdown in the Cedar River Watershed, this has been and should continue to be a major consideration in the development of timber harvest plans.

II. BACKGROUND

A. Ownership Patterns

At the time the City of Seattle became established, a considerable area of the Watershed was still in Government ownership. In 1899, an application was made by the City to the Commissioner of the General Land Office at Washington, D.C., requesting the temporary withdrawal from entry, sale, settlement or other disposal, of all lands in the Watershed then owned by the U.S. Government. 3/

This request was granted October 10, 1899, in a letter from Binger Herman of the Department of the Interior, pending determination to establish a forest reserve to include Cedar Lake and lands adjoining.

The acquisition of these Government lands by the City was considered at the same time the private Watershed lands were being acquired and this consideration was translated into action when, on February 28, 1911, Senate Bill 5432 was enacted into law. This Act of Congress withdrew from private entry the public lands in Township Twenty-one North, Ranges Nine, Ten, and Eleven East, and Township Twenty-two North, Ranges Eight, Nine and Ten East. Section II of this Act provided for deposit by the City of a sum (three thousand dollars) sufficient to pay the cost of the survey defining the limits of the drainage basin of the Cedar River within the areas withdrawn. Section III of the Act provided for deposit by the City of a sum (five thousand dollars) sufficient to cover the examination and appraisal of the timber on the withdrawn lands. Section IV of the Act provided that the City of Seattle could secure patent to these Federal lands upon the payment of the appraised value of the timber, plus $1.25 an acre for the lands.

Under this Act, a survey of the Watershed boundary was made and paid for out of the funds deposited by the City. The plan of acquiring the land was under discussion by the City for some time. It became apparent that buying the lands from the Government would require an outlay estimated to be at least four hundred thousand dollars plus annual interest of twenty thousand dollars. This was a financial burden that neither the City nor the Water Department could readily assume at that time.

Further action was dropped in favor of a plan proposed by the U.S. Government to constitute a forest reserve of these lands under control and protection of the Federal Government.

It was not until June 15, 1922, by authority of Ordinance 43638, that the City relinquished and waived all claims and rights under this Act of Congress, and there was returned to the City $5,217 from the original deposit of eight thousand dollars, the crest line survey having cost $2,783.

Since the early 1900's, the City of Seattle had pursued the objective of obtaining total ownership of all lands within the Administrative boundary of the Cedar Watershed. Many parcels have been purchased outright. The majority of recent acquisitions have been through land exchanges with the U.S. Forest Service. National Forest lands within the watershed are traded for equivalent value City owned property outside of the watershed adjacent to or within existing National Forest boundaries. Private land within the watershed passes to the City after old-growth timber harvest is completed.

Percentage of ownership of the 90,495 acres within the Cedar River Watershed at different periods of time is summarized as follows:

	1943	1962	1978	1983
U.S. Forest Service	25.8	23.5	20.1	20.1
City of Seattle	70.0	73.0	78.6	78.9
Private Owners (This is land ownership only. Private timber on City owned lands was significant.)	4.2	3.5	1.3	1.0
TOTALS	100.0	100.0	100.0	100.0

Note: The first Forest Service exchange with the City was concluded in 1953 transferring 2,455.93 acres to the City. The second exchange transferred 3,429 acres in 1967. 5/

5/ Hellman, Bob; 1983. Personal correspondence. City of Seattle Water Department, North Bend, WA.

B. 1962 Cooperative Agreement Highlights

In 1962, an agreement called the "Cedar River Watershed Cooperative Agreement" was consummated between the U.S. Forest Service, the City of Seattle, Mountain Tree Farm Company, Weyerhaeuser Company, and Scott Paper Company. This agreement regulated methods of logging, rate of cut, the location, construction, maintenance, and joint use of roads, and provided for fire protection and sanitary measures. Also stated in the agreement is "The Forest Service's ultimate objective within the Unit is to exchange National Forest lands therein to the City in order thereby to consolidate National Forest holdings elsewhere."

C. Cedar-Tolt Environmental Impact Statement

In 1979 the Forest Service cooperated with the City as a joint partner in the preparation of an Environmental Impact Statement covering a watershed management plan for the major natural resources in the Cedar River and Tolt River Watersheds. The E.I.S. was prepared by the City in accordance with the Washington State Environmental Protection Act. After the final E.I.S. was prepared the Forest Supervisor directed the North Bend District Ranger to manage National Forest lands within the Cedar River Watershed according to the guidelines and direction set forth in the E.I.S. (Memorandum of 9/18/79 designated "1920 Land Management Planning" from Don Campbell, Forest Supervisor to Floyd Damoth, District Ranger.)

D. Distribution of the Annual Allowable Cut

The period between 1910 and 1920 was the time of greatest logging activity with over 100 million board feet cut per year. 3/

In 1917 the city entered into a long term contract with Pacific States Lumber Company to cut a minimum of 40 million board feet/year until all the merchantable timber in the Upper Watershed had been logged. In 1930 the City Council brought suit against the lumber company to cancel the contract. A Superior Court decision in 1931 found that no damage to the watershed had been done by the timber removal and the contract continued in force until terminated by bankruptcy of the timber company in 1939.

In the early 1940's, the private timber owners and the City commenced discussions concerning the coordinate management of the Cedar River Watershed with emphasis on achieving the objective of each of the parties. An agreement was ultimately developed in 1945 which became the Cedar River Logging Agreement. While addressing many issues relative to management of the watershed, one of the more significant was the establishment of the annual sustained allowable cut as 35 MM board feet/year.

The distribution of the allowable cut over time between the parties is summarized as follows:

	Volumes in Million Board Feet		
	1945	1962	1969 to the present*
Mtn. Tree Farm)	21.0	20.0	20.2
City		5.0	5.1
U.S. Forest Service	14.0**	9.1	9.7
Uncommitted	---	0.9	---
TOTAL	35.0	35.0	35.0

Since Mt. Tree Farm has nearly removed all of it's timber, the Forest Service share could increase greatly within the next few years.

*Mt. Tree Farm, by letter, has assigned the Forest Service some of their share of the cut so that an average of 25.4 million board feet/year is available for the Forest Service's share for the 1983-1987 period.

**Unused portion is available to Mtn. Tree Farm Co.

E. Silvicultural Practices

1. Slash Treatment

In the early history of the watershed, broadcast burning was done on most areas. The 1944 Wolman Report 4/ recommended that slash burning be avoided in the upper watershed. The last broadcast burning was done in 1966 when a 16 acre clearcut on National Forest land was burned by the City. Improved utilization standards on private lands and the Forest Service policy of yarding unutilized material to landings, has eliminated the need to broadcast burn for either site preparation or hazard abatement reasons.

2. Size of Clearcuts

Cutting on private lands has been characterized by large continuous clearcuts which often removed an entire section of land within several seasons. Because of the small allocated cut, most Forest Service sales have consisted of small salvage sales with clearcut units under 50 acres in size.

4/ Wolman, Abel, Chairman 1944. Report on the water supply and the Cedar River Watershed of the City of Seattle, Washington by the Cedar River Watershed Commission. Unpublished report. City of Seattle Forestry Department, North Bend, WA.

3. Logging Systems

Since 1962, 95% of the logging has been accomplished with the highlead system. The remainder has been logged with tractors, mobile yarders, or skyline logging systems which suspend one end of the log during yarding.

4. Reforestation

Reforestation has been accomplished by a combination of tree planting, seeding, and natural regeneration. Since 1962 about 67% of the reforestation has been accomplished by natural regeneration, primarily on City lands. Nine percent has been accomplished by seeding, all on City lands, and the remaining 24% has been accomplished by planting trees. In the high elevation true fir areas, many residual silver fir seedlings survive the logging operation. Fill-in type planting is usually all that is required.

F. Washington State Forest Practice Act Standards

The State Forest Practice Act governs harvesting and reforestation on private and City lands. There are no limitations on the size of clearcuts in the present law. The law requires that cutover areas be reforested with a minimum of 300 seedlings/acre within 3 years if planted, or within 5 years if natural seeding is used.

G. National Forest Management Act of 1976 Standards

The National Forest Management Act of 1976 (hereinafter referred to as NFMA) directed the Secretary of Agriculture to promulgate regulations which included: specifying guidelines for land management plans which insure coordination of economic and environmental aspects; assurance that timber will be harvested from National Forest system lands only where soil, slope, or other watershed condition will not be irreversibly damaged; assurance that such lands can be adequately restocked within 5 years after harvest. NFMA also directed the Secretary of Agriculture that clearcutting will be used only where there are established maximum size limits with provision to exceed the established limits after appropriate public notice and review by the appropriate Forest Service officer.

H. Regional Silvicultural Guidelines

The Pacific Northwest Region (R-6) established silvicultural guidelines which limit the maximum clearcut size in the coastal Douglas-fir zone to 60 acres in the Douglas-fir type and 40 acres on all other lands. The guidelines provide that the limits may be exceeded by 50% when certain specified criteria are met.

The guidelines also normally limit the size of created openings (clearcuts) contiguous to natural openings, 30 acres or larger, not to exceed 1/3 the size of the natural opening and not more than 1/3 of the perimeter of the natural openings. This guideline appears to have been developed to protect wildlife values and visual management objectives associated with natural openings.

The guidelines also provide that a created opening (clearcut) will no longer be considered a created opening when the area becomes stocked to prescribed levels of crop trees at or above 4 1/2 feet in height and which are free to grow. This guideline effectively delays further entries, except for salvage, to about 10 years from planting in the higher elevation areas and to about 6 years from planting in the lower elevation Douglas-fir types.

When the first draft of the R6 guidelines was circulated it contained a statement which excepted the Shelton Sustained Yield Unit and other areas "covered by formal agreements with cooperators". At that time, the Cedar River Watershed would have been one of the exceptions because of the 1962 Cooperative Agreement and the 1979 E.I.S. When the present revised draft was circulated, only the Shelton Sustained Yield Unit remained as an exception, apparently because it was established by Congress while other agreements, even though approved by the Chief of the Forest Service, could theoretically be cancelled at any time.

I. Past Impacts on Water, Soil and Reforestation

1. Impacts on Water and Soils

The Seattle water supply system is one of the largest surface systems in the nation that meets Federal and State water quality standards using intake screening and simple gas chlorination. Regulations established by the State Board of Health outlines minimum treatment procedures and source protection requirements which must be met in order for the City to continue disinfection as the sole means of treatment. The source protection requirements do not include a limit on the size of clearcut operations.

Water Department records show that water taken from the Cedar River at Landsburg meets Federal and State drinking water standards and is used by the City an average of 345 days each year. It is because of the Water Department's reluctance to utilize the Cedar River when it exceeds 1 turbidity unit that the river is not used on many of the remaining days of the year.

Logging has occurred on the watershed since about 1885. Logging began in the lower watershed and proceeded easterly with extensive areas being logged between 1910 and 1920. As logging continued at a rapid pace in the 1920's, concerns were raised regarding potential impacts of logging on water quality. However, investigations into logging pratices on the watershed in 1930 found that railroad logging caused few if any impacts on the City's water supply. The Wolman Report 4/ examined previous logging on the watershed and confirmed the compatibility of logging and high water quality. These findings were reinforced in 1979 when review by the City and Forest Service as part of the investigations conducted for the Cedar River and Tolt River Watershed Management Plan concluded that timber harvest activities in the City's watersheds were compatible with State and Federal water quality standards.

Past studies have shown that logging, road construction and maintenance have had very little impact on turbidity in the Cedar River Watershed. While road construction may have an impact on turbidity, that impact is minimized when such construction is properly conducted. Although it is recognized that turbidity has resulted from occasional road construction projects, these occurrances generally occur during periods of exceptionally heavy rainfall and snow melt and are of short duration.

Recent studies have indicated that sedimentation introduced into Morse Lake is approximately 2 mm in depth per year, a fraction of the sedimentation that is occurring nearby in Lake Washington and Lake Sammamish outside of the watershed. Studies by Birch in 1976 found that sedimentation rates in the lake increased in about 1930 and have remained the same since. He attributed the rate increase to the change from railroad to truck logging. Additional sources of sediment not considered during the study are sediment from river bank erosion in the upper Cedar River and from the shoreline of Chester Morse Lake when it was temporarily elevated in lake level from 1930 to 1957.

2. Impacts of Logging on Reforestation

Reforestation is frequently used as a barometer to measure the impacts of logging and road construction. Improper logging methods can affect the land's growing potential and therefore subsequent regeneration. The most apparent impact of road construction is the extent of growing space taken out of production due to improper road design or construction methods.

In the Cedar River Watershed, reforestation has never been identified as a significant problem. In most respects, cutover lands at the higher elevations reforest quickly and generally become overstocked with true fir and hemlock within a few years of logging. Vast acreages of land clearcut and burned in the lower watershed in the early 1900's quickly reforested to Douglas-fir and now represents one of the largest municipally owned forests in the nation. The Cedar River Watershed is truly an outstanding example of natural regeneration.

The rapid natural reforestation that is occurring at the higher elevations can be attributed to a number of factors including weather, soils and the availability of a suitable seed source. The more moist north slopes of the watershed generally contain advance reproduction in the form of one to ten year-old seedlings. These young trees are generally well established and survive highlead logging under most conditions. It is not uncommon to find cutover areas fully stocked with naturals immediately following the logging operation.

Regeneration surveys have found that unit size has had virtually no impact on reforestation. In instances where complete sections of private timber have been logged in a five to ten year period, the areas have not only become reforested as a result of advanced reproduction and natural seeding, but in most cases the cutting units have become overstocked with as many as 2,500 stems per acre.

In evaluating the impacts of logging and road construction on regeneration in the watershed, it is important to recognize that the watershed contains some hot, dry south slopes and exposed ridges similar to any other management unit. These areas generally require some means of artificial regeneration following logging. Fortunately, problem areas represent a very small part of the total watershed area.

J. Management of City Exchange Lands

To facilitate the exchange program in the Cedar River Watershed, the City has acquired property within the boundaries of the National Forests within the State of Washington to complete the exchange of those properties for Federal lands in the watershed. However, these lands do not support timber of sufficient value to equal the value of Government timber existing on National Forest lands within the Cedar River Watershed. Therefore, the exchange program is contemplated to proceed only as the National Forest timber is harvested from these lands or when some accomodation of reserved timber can be developed. At the present rate of harvest, it is anticipated that exchanges will be considered in 1,000 to 1,500 acre increments. On this basis, 12 to 15 exchanges will be necessary over the next 20 to 35 years in order to complete the program.

Property acquired by the City for exchange purposes is located in ten counties throughout the State. The majority of City exchange land, 12,827 acres, is situated in Chelan County in eastern Washington. Other properties are scattered throughout the State on both sides of the Cascades.

Most City lands designated for exchange are forested with second growth in varying stages of development from young reproduction to stands approaching maturity. Until these lands are exchanged for National Forest lands in the watershed, they will likely remain unmanaged by the City. Because of logistics involved in travel and administration, the cost of providing intensive management of these stands at this time would more than exceed the benefits derived from such a program.

Considering that these lands will eventually become part of the National Forest system, the loss in productivity through the lack of management must be considered. It has been determined that the harvesting of remaining Forest Service timber in the Cedar River Watershed under the current regional silvicultural guidelines would delay the final exchange of City and Forest Service lands in the watershed for at least 29 years which is 4 to 13 years more than the other alternatives considered. In addition to delaying the use of exchange properties by the Forest Service for an additional period of time, continuation of the silvicultural guidelines would prolong the number of years that City lands designated for exchange would remain in an unmanaged and less productive state.

III. ALTERNATIVES

Five alternatives were developed and analyzed. These alternatives are:

A. No change from present Regional silvicultural guidelines. (Maximum clearcut size is 60 acres in the Douglas-fir type and 40 acres elsewhere and clearcuts remain created openings until prescribed crop tree stocking is at or above 4 1/2 feet in height and free to grow.)

B. Retain the 60 and 40 acre maximum clearcut size limits described in the Regional guidelines but allow adjacent clear cutting to resume as soon as the areas are certified as completed reforestation projects. (Normally at the time of the third year exam.)

C. Double the R6 maximum clearcut size to 120 acres in the Douglas-fir type and 80 acres elsewhere but retain the present standard for created openings. (Prescribed crop tree stocking is at or above 4 1/2 feet in height and free to grow.)

D. Double the R6 maximum clearcut size to 120 acres in the Douglas-fir type and 80 acres elsewhere and allow adjacent clearcutting to resume as soon as the areas are certified as completed reforestation projects. (Normally at the time of the third year exam.)

E. No restrictions on maximum clearcut size or cutting next to created openings except as restricted by Washington State Forest Practices Act Standards.

The following requirements would apply to all five of the preceeding alternatives:

1. The present limit of 35 MM bd. ft./year for the Cedar River Watershed.

2. All other laws and regulations applicable to National Forest lands. (The National Forest Management Act, The Riparian policy, The Endangered Species Act, and so forth.)

Standard 2-1 of the Regional Silvicultural guidelines permits exceeding the created opening acreage size limits by not more than 50 percent without review by the Regional Forester when certain criteria are met. This exception also applies to the 120 and 80 acre size limits being considered in Alternatives C and D above.

IV. EFFECTS OF IMPLEMENTATION

This section describes the major consequences of implementing the five alternatives identified in the previous section in terms of outputs, costs, and environmental effects.

It has usually been considered desirable to construct as much of the permanent road system as possible at the time of the initial entry into an area. This provides access for blowdown salvage operations and fire control, and minimizes road construction costs by reducing the amount of move in move out costs and by enabling the most economical road construction equipment and techniques to be used. Assuming that this practice will continue, road construction will be completed at about the same rate for all alternatives.

A detailed, section by section, logging schedule was prepared for each alternative. This "cutout" analysis is listed in the appendix and forms the basis for much of the following descriptions of the effects of implementation.

A. Soils and Water

Based on the historical record of road construction and logging in the watershed, little adverse effect would occur from implementation of any of the alternatives. The slight differences which could occur would be directly related to the rate of harvest. Because of this, Alternative E (668 acres/yr) would have the most impact followed in descending order by Alternatives D (535 acres/yr), B (509 acres/yr), C (411 acres/yr), and A (369 acres/yr).

B. Land Exchange

The exchange of National Forest lands in the Cedar River Watershed normally only occurs after the old growth timber has been harvested and occurs by exchange of legal subdivision such as Government Lots or 1/4 of 1/4 sections. The alternative which harvests the old growth timber the fastest and by the largest continuous blocks best facilitates the completion of the planned land exchange objective as fewer but larger exchanges would proceed at a more rapid rate.

Alternative E best facilitates the land exchange (all sales sold in 16 years) followed by Alternatives D (20 years), B (21 years), C (26 years), and A (29 years).

C. Timber Sales Program

Until recent years the Forest Service share of the watershed's annual allowable cut has been limited to 9.7 million board feet, much lower than the amount which would have been harvested without this restriction. As a result, the North Bend Ranger District has been forced to make up the difference in it's programmed harvest from areas outside of the Cedar River Watershed. Heavy cutting on intermingled private lands outside the watershed during the last 10 years has made it desirable to temporarily reduce the amount of harvest on National Forest lands located within some of the heavily cut over drainages. Shifting more of the Forest Service harvest to the Cedar River Watershed provides more flexibility in accomplishing this objective. Alternative E (30.0 MMBF/yr) best facilitates this objective with Alternative D(24.0) next, followed by Alternatives B (22.8), C (18.5), and A (16.5). The present 35.0 MMBF/yr. Cedar River maximum still serves as the upper limit permitted.

D. Costs

1. Road Maintenance

Timber haul roads are maintained with funds collected on the basis of volume and miles hauled over. The Forest Service also contributes a share of maintenance costs for roads which provide access to National Forest lands from which no hauling is currently being done. As land exchanges reduce the amount of outlying National Forest lands, Forest Service road maintenance costs for these latter category roads would be eliminated. The most favorable alternative for reducing these costs would be Alternative E, followed in descending order by D, B, C and A.

2. Logging Costs

Larger cutting units generally result in cheaper logging costs. Any harvest program that minimizes the occurance of blowdown and thus the need for a small unit, salvage timber sale program, reduces logging costs. Alternative E would have the lowest costs for both of the preceeding reasons. followed in descending order by Alternatives C and D with Alternatives A and B having the highest logging costs.

3. Sale Preparation Costs

Sale preparation costs are also reduced with larger cutting units as less perimeter has to be laid out, posted and traversed than for an equivalent acreage of smaller units. Any harvest program that minimizes the occurance of

blowdown and thus the need for small salvage sales also reduces sale preparation costs. Alternative E would have the lowest sale preparation costs followed by Alternatives C and D with Alternatives A and B being the most costly.

V. EVALUATION OF ALTERNATIVES

The evaluation of the identified alternatives was accomplished using the Kepner-Tregoe decision making process. (Worksheets follow) The process is described as follows:

A. The evaluation criteria were given a numerical weight (1-20) based on the relative importance associated with each criterion.

B. The alternatives were then compared against each evaluation criterion and a score given. This is the "score". Scores range from 1-20 with alternative(s) best meeting evaluation criterion receiving a "20". Scores multiplied by the weight result in the weighted score.

The scores were determined based on the following criteria:

1. Minimize adverse impacts on soils.

   a. Minimize the size of created opening.
   b. Balance impacts now and in future entries.

2. Minimize adverse impacts to water quality.

   a. Best distribution of created openings to balance impacts over time.
   b. Best distributes units along streams - do not cut all along a stream at any one entry.

3. Provides the most economical return.

   a. Lowest road maintenance costs.
   b. Lowest sale preparation costs.
   c. Lowest logging costs.

4. Best facilitates land exchange.

   a. Fewest number of exchanges to complete program.
   b. Exchange completed over shortest time period.

5. Best able to maintain 35 MMBF cut/year.

EVALUATION CRITERIA	WEIGHT	ALTERNATIVES SCORE/WEIGHTED SCORE A	B	C	D	E
1. Minimize Adverse Impacts to Soils	18	20/360	20/360	19/342	19/342	17/306

Road construction, which causes the major impact to soils, would be the same for all alternatives. Minor differences between alternatives would occur as a result of the different sizes of created openings and from balancing impacts.

Alternative A would have the least impact on soils because it has the smallest clearcut sizes and best distributes clearcuts both in space and over time.

Alternative B would have only slightly more impact because adjacent clearcutting would resume about 4 years sooner.

Alternative C would have slightly more impact because clearcut sizes would be doubled.

Alternative D would have only slightly more impact than C because adjacent clearcutting would resume about 4 years sooner.

Alternative E would have the most impact on soils because clearcut sizes could be the largest and adjacent cutting could resume at any time.

Past experience has shown little actual significant differences between the two extremes.

EVALUATION CRITERIA	WEIGHT	ALTERNATIVES SCORE/WEIGHTED SCORE A	B	C	D	E
2. Minimizes Adverse Impacts to Water Quality The impacts to water quality would be ranked essentially the same as the impacts to soils for the same reasons stated in Criteria 1. Here again, little actual differences have occured in the past between the two extremes.	20	20/400	20/400	19/380	19/380	17/340
3. Provides the Most Economical Return Alternative A is the most costly in road maintenance, sale preparation, and logging costs. Alternative B would have the same sale preparation and logging costs as A but would have less road maintenance costs as exchanges are facilitated at early dates. Alternative C would be less costly than B in all 3 ways. Alternative D would be less costly than C in road maintenance as exchanges are facilitated earlier and would have the same sale preparation and logging costs as C. Alternative E would be the least costly in all ways.	15	12/180	14/210	16/240	19/285	20/300
4. Best Facilitates Land Exchange Alternative E best facilitates the land exchange with all sales sold in 16 years followed by Alternatives D (20 years), B (21 years), C (26 years) and A (29 years).	10	11/110	14/140	14/140	18/180	20/200

EVALUATION CRITERIA	WEIGHT	ALTERNATIVES SCORE/WEIGHTED SCORE A	B	C	D	E
5. Best Able to Maintain an Average of 35 MMBF Cut/Year	10	11/110	15/150	12/120	16/160	20/200

Alternative E maintains the highest level of cut (30.0 MMBF/year) followed by Alternatives D (24.0), B (22.8), C (18.5), and A (16.5).

WEIGHTED AVERAGE SUMMARY

	A	B	C	D	E
1. Minimizes adverse impacts to soils	360	360	342	342	306
2. Minimizes adverse impacts to water quality	400	400	380	380	340
3. Provides the most economical return	180	210	240	285	300
4. Best facilitates land exchange	110	140	140	180	200
5. Best able to maintain 35 MMBF/year cut	110	150	120	160	200
TOTALS	1160	1260	1222	1347	1346

VI. RECOMMENDATIONS

The recommended alternative is Alternative D, (Double the R6 maximum clearcut size to 120 acres in the Douglas-fir type and 80 acres elsewhere and allow adjacent clearcutting to resume as soon as the areas are certified as completed reforestation projects).

Alternative D was selected because it is nearly as good as Alternative E in reducing blowdown, facilitating the land exchange program, maintaining the harvest rate and reducing costs while it provides a higher margin of safety against adverse impacts to soil and water resources than Alternative E does. While many years of experienced road building and timber harvest, primarily under Washington State Forest Practice Act Standards, have been completed with acceptable impacts, the soil and water resources are important enough to warrant this extra degree of protection.

Based on 80 years of experienced activities in the watershed, Alternative D should provide minimal adverse impacts on the resources while improving the opportunity to reduce blowdown, reduce costs, facilitate the land exchange program, and maintain the allowable cut.

Environmental analysis will continue to be prepared for Cedar River activities on a case by case basis by interdisciplinary team members. This will allow the necessary safeguards to be designed into projects while Alternative D will remove some of the restrictions which are unnecessary in this watershed.

The City of Seattle supports the concepts in Alternative D as a significant improvement over the present situation (See Appendix).

I recommend that this analysis be forwarded to the Forest Supervisor and Regional Forester for review. Following public review and Regional Forester approval, Alternative D may be implemented.

APPENDIX

Owners
and Faciliti

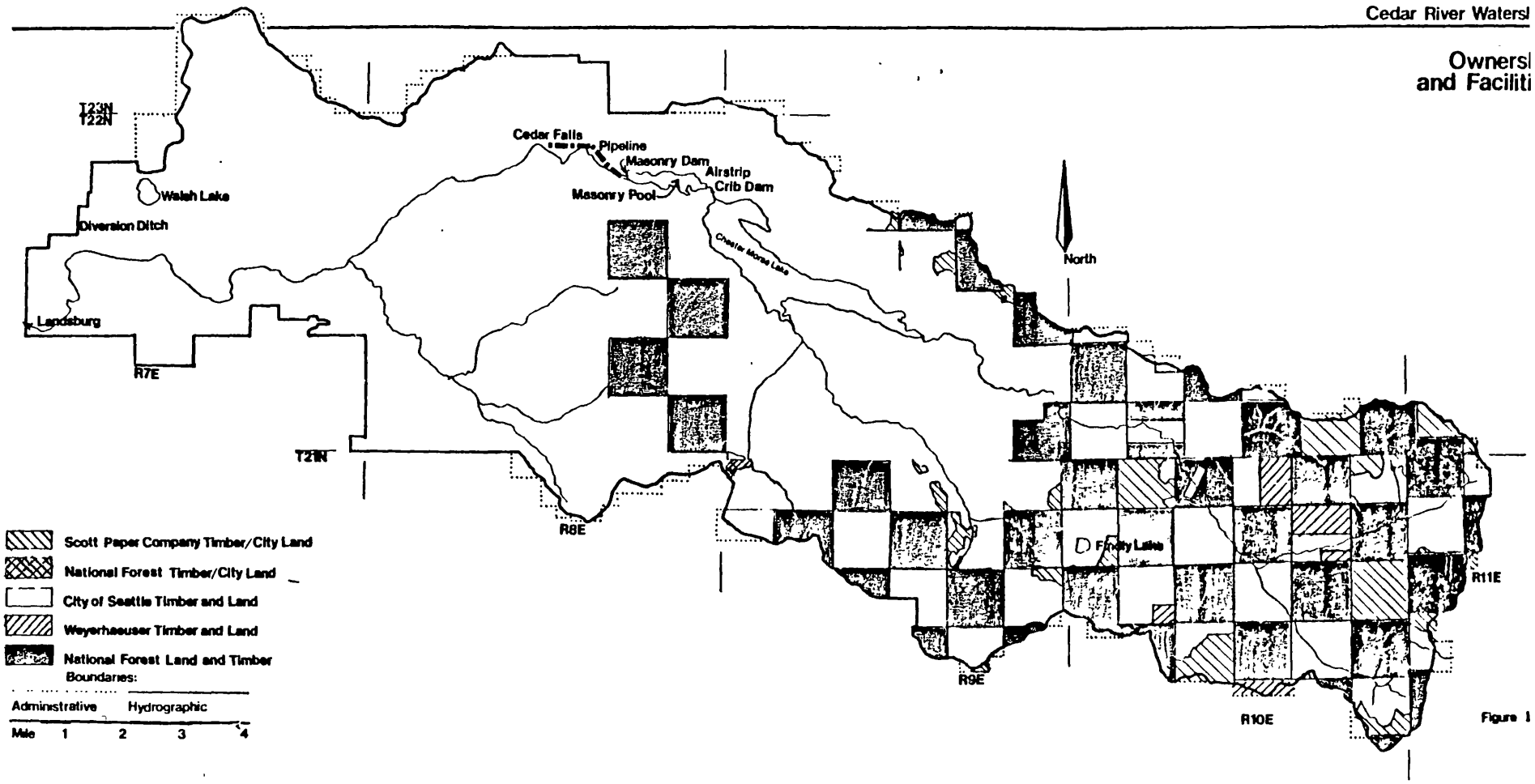

Figure 1

Seattle Water Department

Kenneth M. Lowthian, Superintendent
Charles Royer, Mayor

January 6, 1984

Mr. J. D. MacWilliams
Forest Supervisor
Mt. Baker-Snoqualmie National Forest
1022 First Avenue
Seattle, Washington 98104

Dear Mr. MacWilliams:

I have reviewed the report titled "An Analysis of the Effects of Various Silvicultural Standards and Conditions on National Forest Lands Within the Cedar River Watershed" recently prepared by personnel of the North Bend Ranger District with cooperation from the staff of the City's Watershed and Transmission Division.

I concur with that report and the selection of Alternative D as the preferred revised silvicultural guidelines that will most effectively and efficiently achieve the goals of the management of National Forest lands within the Cedar River Watershed while sustaining the objectives of the City regarding quantity and quality of water produced from that watershed as part of its water supply system.

I hope your efforts are successful in achieving these desirable revisions to the Region Six Silvicultural Guidelines.

Sincerely,

Kenneth M. Lowthian

KENNETH M. LOWTHIAN
Superintendent of Water

KML:jme

Seattle Water Department—Exchange Building, 11th Floor
821 Second Avenue

C. Summary of Harvest History Within the Cedar River Watershed

	Acres Cut	Volume Cut (MM BD FT)	Average Acres/YR	Average Volu /YR (MM BD F
Prior to 1900 -	(2,479) 6/	Not available	---	---
1900 - 1923 - (24 YRS)	29,684 3/	2,800 3/	1,237	116.6
1924 - 1943 - (20 YRS)	13,405 4/	1,000 4/	670	50.0
1944 - 1961 (18 YRS)	9,055 5/	544 5/	503	30.2
1962 - 1977 - (16 YRS)	11,780 5/	569.9 5/	736	35.6
1978 - 1982 - (5 YRS)	3,056 5/	135.1 5/	611	27.0 *
TOTALS	66,980	5,049	807	60.8

* The depressed timber market during the last few years has resulted in this reduced level of cutting.

3/ McWilliams, Mary 1955. Seattle Water Department History 1854:1954 Dogwood Press, Place of Publication unknown

4/ Wolman, Abel, chairman 1944. Report on the water supply and the Cedar River Watershed of the city of Seattle, Washington by the Cedar River Watershed Commission. Unpublished report. City of Seattle Forestry Department, North Bend, Wa.

5/ Hellman, Bob, 1983. Personal correspondence. City of Seattle Water Department, North Bend, Wa.

6/ Lamb, John 1914. The Seattle Municipal Water Plant Moulton Printing Co., Seattle, Wa.

E. Timber Logged in the Cedar River Watershed 5/
1944 - 1961

Year	Volume (BF)	Acres
1944	34,234,240	797
1945	29,329,780	444
1946	21,615,680	500
1947	22,687,300	357
1948	23,078,080	246
1949	29,172,380	415
1950	23,253,480	380
1951	26,118,629	313
1952	27,327,270	406
1953	36,114,980	724
1954	38,043,700	449
1955	32,554,940	537
1956	32,443,840	564
1957	37,538,040	504
1958	43,467,410	816
1959	36,867,430	678
1960	26,264,730	439
1961	24,241,390	486
	544,353,299	9,055
18 Year Average	30,241,850	503

5/ Hellman, Bob, 1983. Personal correspondence. City of Seattle, Water Department, North Bend, Wa.

E. Timber Harvested on the Cedar River Watershed Under the Cedar River Watershed Cooperative Agreement 5/

1962 - 1982

Year	Mountain Tree Farm	U.S.F.S.	City	Total
1962	861 Acres	- Acres	24 Acres	885 Acres
1963	399 "	410 "	56 "	865 "
1964	151 "	313 "	90 "	554 "
1965	396 "	109 "	138 "	643 "
1966	638 "	182 "	80 "	900 "
1967	655 "	137 "	65 "	857 "
1968	653 "	79 "	155 "	887 "
1969	480 "	215 "	78 "	773 "
1970	303 "	112 "	89 "	504 "
1971	311 "	105 "	58 "	474 "
1972	387 "	305 "	128 "	820 "
1973	503 "	526 "	112 "	1,141 "
1974	122 "	706 "	84 "	912 "
1975	426 "	103 "	35 "	566 "
1976	449 "	156 "	20 "	625 "
1977	127 "	101 "	141 "	369 "
1978	263 "	157 "	136 "	556 "
1979	378 "	304 "	27 "	709 "
1980	559 "	300 "	91 "	950 "
1981	195 "	241 "	83 "	519 "
1982	122 "	200 "	0 "	322 "
	8,378 "	4,763 "	1,690 "	14,831 "
20 year average	376	238	83	697

5/ Hellman, Bob, 1983. Personal correspondence. City of Seattle, Water Department, North Bend, Wa.

F. ASSUMPTIONS USED FOR ALL ALTERNATIVES
WHEN DEVELOPING THE CEDAR RIVER CUTOUT DATA

1. The National Forest share of the total programmed harvest in the Cedar River will not exceed: an average of 20.0 MMBF/year for FY 84-88; 33.0 MMBF/year for FY 89-93; and 35.0 MMBF/year for 94-cutout date.

2. An average of 10 years are required to establish regeneration at 4½' tall: (3 years to harvest an area after it is sold and 7 years for seedlings to reach 4½' tall).

3. FY 84 and 85 Cedar River programmed harvest will be the same for all alternatives. The lead time required to prepare a timber sale requires maintaining present harvest schedules for these fiscal years.

4. An average of 6 years are required before adjacent cutting can occur with alternatives B and D; 3 years to harvest the sale and 3 years to assure reforestation standards are met.

5. Cutout will be completed from 2 to 4 years after the last sale is sold (the sale volume will determine the lngth of time).

   Total volume differences between alternatives are a result of rounding.

SUMMARY OF CUTOUT BY ALTERNATIVE

Alternative	# of years to sell last T.S.	Ave. harvest Vol./year	Ave. Acres harvested/year
A	29	16.5	369
B	21	22.8	509
C	26	18.5	411
D	20	24.0	535
E	16	30.0	668

ALTERNATIVE A

Cedar River Cutout Utilizing Existing Silviculture Standards and Guidlines

FY 1984

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S14	162	8.8
T22N, R9E		
S10	111	4.0
S14	10	.9
T22N, R10E		
S28	17	.8
T21N, R10E		
S10	28	1.8
S12	52	2.4
T21N, R10E		
S8	36	1.6
S18	37	1.7
	453	22.0

FY 1985

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S24	238	10.5
S14	40	1.8
T22N, R10E		
S34	93	3.8
S36	48	1.9
T21N, R9E		
S4	80	3.6
S10	54	2.4

FY 1985 Continued

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E		
S2	12	.5
T21N, R11E		
S6	163	6.4
S30	50	2.2
		23.1

FY 1986

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R9E		
S12	120	4.7
T21N, R10E		
S18	118	4.5
	238	9.2

FY 1987

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R10 E		
S34	76	3.4
T21N, R10E		
S2	60	2.0
S12	40	1.6
S14	192	6.3
S24	70	2.8
S10	52	2.3
T21N, R11E		
S18	12	.5
	502	18.9

FY 1988

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R9E		
S36	135	6.2
T21N, R10E		
S4	123	6.5
S6	63	2.8
S12	60	2.6
S22	150	6.5
T21N, R11E		
S8	17	.8
S18	59	2.1
	607	27.5
T22N, R10E		
S34	76	3.4
	683	30.9

FY 1989

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R10E		
S32	115	4.6
S30	40	2.2
T22N, R8E		
S26	80	3.5
T21N, R9E		
S8	100	4.0
S14	60	3.0
S16	40	1.6
T21N, R10E		
S8	120	7.0
S16	30	1.4
S28	30	1.3
	615	28.6

FY 1990

Legal Description	Acres Harvested	MMBF Volume Harvested
NO VOLUME		

FY 1991

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E		
S24	40	1.8

FY 1992

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E		
S10	80	4.0

FY 1993

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R9E		
S14	40	1.7
S24	100	5.0
T22N, R10E		
S30	80	3.6
S28	70	3.2
	290	13.5

FY 1994

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S14	190	8.6
S36	40	1.8
T22N, R9E		
S10	60	2.7
T21N, R9E		
S22	80	3.6
S24	33	1.5
T21N, R10E		
S36	40	1.8
T21N, R11E		
S8	40	1.8
S18	30	1.4
	513	23.2

FY 1995

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S24	135	6.1
T21N, R9E		
S4	40	1.8
S10	60	2.7
T21N, R10E		
S20	60	2.7
T22N, R10E		
S36	80	3.6
T21N, R11E		
S6	199	9.0
	574	25.9

FY 1996

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R9E		
S12	140	6.3
T21N, R10E		
S18	161	7.2
	301	13.5

FY 1997

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E		
S22	125	5.6
S14	204	9.2
S12	40	1.8
S24	175	7.9
	544	24.5

FY 1998

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R9E		
S36	103	4.6
T22N, R10E		
S34	212	9.5
T21N, R10E		
S2	170	7.6
S4	77	3.5
S12	220	9.9
	782	35.1

FY 1999

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S26	80	3.6
T21N, R9E		
S8	52	2.3
S16	20	.9
S14	150	6.8
T21N, R10E		
S8	40	1.8
S16	85	3.8
S6	144	6.5
T21N, R11E		
S8	32	1.4
S18	170	7.6
	773	34.7

FY 2000

Legal Description	Acres Harvested	MMBF Volume Harvested

NO VOLUME

FY 2001

Legal Description	Acres Harvested	MMBF Volume Harvested

NO VOLUME

FY 2002

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E		
S10	54	2.4

FY 2003

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R9E		
S24	100	4.5
T22N, R10E		
S30	110	5.0
	210	9.5

FY 2004

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S14	190	8.6
S36	20	.9
T22N, R9E		
S10	40	1.8
S14	30	1.4
T21N, R9E		
S22	30	1.4
	310	14.1

FY 2005

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S24	135	6.1
T21N, R9E		
S4	30	1.4
S10	60	2.7
T21N, R10E		
S20	40	1.8
T22N, R10E		
S36	80	3.6
T21N, R11E		
S6	198	8.9
	543	24.5

FY 2006

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R9E		
S12	140	6.3
T21N, R10E		
S18	161	7.2
	301	13.5

FY 2007

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E		
S22	125	5.6
S14	204	9.2
S24	175	7.9
	504	22.7

FY 2008

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R9E		
S36	102	4.6
T22N, R10E		
S34	212	9.5
T21N, R10E		
S12	220	9.9
T21N, R11E		
S8	31	1.4
S18	176	7.6
	741	33.0

FY 2009

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S26	80	3.6
T21N, R9E		
S14	150	6.8
S16	85	3.8
S6	175	6.4
T22N, R10E		
S30	10	.4
T21N, R10E		
S2	170	7.6
T21N, R10E		
S6	143	6.5
	813	35.1

FY 2010

Legal Description	Acres Harvested	MMBF Volume Harvested
	NO VOLUME	

FY 2011

Legal Description	Acres Harvested	MMBF Volume Harvested
	NO VOLUME	

FY 2012

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S10	54	2.4
TOTAL -	10691	476.1

ALTERNATIVE B

Cedar River Cutout Utillizing 40 and 60 acre Clearcuts with adjacent Clearcutting allowed again after the 3 year certification.

FY 1984

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S14	162	8.8
T22N, R9E		
S10	111	4.0
S14	10	.9
T22N, R10E		
S28	17	.8
T21N, R10E		
S10	28	1.8
S12	52	2.4
T21N, R10E		
S8	36	1.6
S18	37	1.7
TOTAL	453	22.0

FY 1985

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S24	238	10.5
S14	40	1.8
T22N, R10E		
S34	93	3.8
S36	48	1.9
T21N, R9E		
S4	80	3.6
S10	54	2.4
T21N, R10E		
S2	12	.5
T21N, R11E		
S6	163	6.4
S30	50	2.2
	778	33.1

FY 1986

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R9E		
S12	125	5.6
T22N, R10E		
S32	80	3.6
T21N, R10E		
S6	120	5.4
T22N, R9E		
S36	120	5.4
	445	20.0

FY 1987

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S4	120	5.4
T21N, R10E S18	150	6.7
T21N, R10E S22	160	7.2
	430	19.3

FY 1988

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S14	200	9.0
T21N, R10E S12	200	9.0
T22N, R10E S36	70	3.1
	470	21.1

FY 1989

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R11E S6	200	9.6

FY 1991

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E S24	100	4.5
T21N, R9E S4	40	1.8
T21N, R9E S10	80	3.6
T21N, R9E 14	120	5.4
T21N, R9E S22	80	3.6
T21N, R9E S24	33	1.5
R22N, R9E S10	80	3.6
T22N, R9E S14	70	3.1
T22N, R9E S24	80	3.6
T22N, R10E S28	40	1.8
T21N, R10E S36	40	1.8
	763	34.3

FY 1992

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R10E S30	90	4.0
T22N, R10E S34	160	7.2
T21N, R10E S2	140	6.3
T21N, R10E S8	100	4.5
T21N, R10E S10	100	4.5
T21N, R10 S16	70	3.1
T21N, R10E S20	60	2.7

FY 1991

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E S24	100	4.5
T21N, R9E S4	40	1.8
T21N, R9E S10	80	3.6
T21N, R9E 14	120	5.4
T21N, R9E S22	80	3.6
T21N, R9E S24	33	1.5
R22N, R9E S10	80	3.6
T22N, R9E S14	70	3.1
T22N, R9E S24	80	3.6
T22N, R10E S28	40	1.8
T21N, R10E S36	40	1.8
	763	34.3

FY 1992

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R10E S30	90	4.0
T22N, R10E S34	160	7.2
T21N, R10E S2	140	6.3
T21N, R10E S8	100	4.5
T21N, R10E S10	100	4.5
T21N, R10 S16	70	3.1
T21N, R10E S20	60	2.7

FY 1992 Continued

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S28	30	1.3
	750	33.6

FY 1993

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R9E S36	120	5.5
T22N, R10E S32	35	1.6
T21N, R9E S12	140	6.3
T21N, R10E S6	120	5.4
T21N, R10E S4	80	3.6
T21N, R10E S18	150	6.7
T21N, R10E S22	130	5.8
	775	34.9

FY 1994

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R10E S36	190	8.6

FY 1994 Continued

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S12	190	3.6
T21N, R10E S14	200	9.0
	470	20.2

FY 1995

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R11E S6	180	8.1
T21N, R11E S8	60	2.7
T21N, R11E S18	145	6.5
	385	17.3

FY 1996

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E S14	130	5.8
T22N, R8E S26	80	3.6
T21N, R9E S8	52	2.3
T21N, R10E S24	150	6.7
	412	18.4

FY 1997

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E S24	85	3.8
T22N, R9E S10	20	.9
T22N, R9E S24	80	3.6
T22N, R10E S28	30	3.6
T21N, R9E S4	30	1.3
T21N, R9E S10	40	1.8
T21N, R9E S14	120	5.4
T21N, R9E S22	30	1.3
	435	19.4

FY 1998

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R10E S30	80	3.6
T22N, R10E S34	174	7.6
T21N, R10E S2	130	5.9
T21N, R10E S8	60	2.7
T21N, R10E S10	80	3.6
T21N, R10E S16	80	3.6
T21N, R10E S20	40	1.8
	640	28.8

FY 1999

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R9E S36	100	4.5
T21N, R9E S12	135	6.1
T21N, R10E S6	110	4.9
T21N, R10E S18	140	6.3
T21N, R10E S22	110	4.9
	595	26.7

FY 2000

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R10E S36	50	2.2
T21N, R10E S12	190	8.5
T21N, R10 S14	200	9.0
	440	19.7

FY 2001

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R11E S6	180	8.1
T21N, R11E S18	145	6.5
	325	14.0

FY 2002

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E S14	110	4.9
T22N, R8E S26	60	2.7
T21N, R10E S24	150	6.7
	320	14.3

FY 2003

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E S24	85	3.8
T22N, R9E S24	40	1.8
T21N, R9E S14	120	5.4
	245	11.0

FY 2004

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R10E S30	70	3.1
T22N, R10E S34	170	7.6
T21N, R10E S2	130	5.8

FY 2004 Continued

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S10	60	2.7
T21N, R10E S16	50	2.2
	480	21.4
TOTAL	10691	479

Alternative C

Cedar River Cutout Utilizing 80 and 120 acre Clearcuts with adjacent Clearcutting allowed again when vegetation reaches 4 1/2 feet in height.

FY 1984

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S14	162	8.8
T22N, R9E		
S10	111	4.0
S14	10	.9
T22N, R10E		
S28	17	.8
T21N, R10E		
S10	28	1.8
S12	52	2.4
T21N, R10E		
S8	36	1.6
S18	37	1.7
	453	22.0

FY 1985

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S24	238	10.5
S14	40	1.8
T22N, R10E		
S34	93	3.8
S36	48	1.9
T21N, R9E		
S4	80	3.6
S10	54	2.4
T21N, R10E		
S2	12	.5
T21N, R11E		
S6	163	6.4
S30	50	2.2
	778	33.1

FY 1986

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R9E S12	200	9.0
T22N, R10E S32	115	5.2
T21N, R10E S6	160	7.2
	475	21.4

FY 1987

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R9E S36	240	10.8
T21N, R10E S4	100	4.5
Ts2N, R10E S18	104	4.7
	444	20.0

FY 1988

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S22	280	12.6
T22N, R10E S36	120	5.4
T21N, R10E S28	30	1.3
	430	19.3

FY 1989

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S14	240	10,8
T21N, R10E S12	215	11.2
T21N, R11E S6	240	10.8
	695	32.8

FY 1990

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R11E S8	80	3.6
T21N, R11E S18	240	10.8
T21N, R11E S30	50	2.2
T21N, R10E S24	160	7.2
T21N, R9E S8	100	4.5
	630	33.7

FY 1991

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S16	30	1.3
T21N, R10E S8	120	5.4
	150	6.7

FY 1992

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E S36	60	2.7
T21N, R9E S22	110	4.9
	170	7.6

FY 1993

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R9E S24	100	4.5
T22N, R10E S30	120	5.4
	220	9.9

FY 1994

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E S14	150	6.7
T22N R8E S26	120	5.4
T21N, R9E S16	60	2.7
T22N, R9E S10	100	4.5
T22N, R9E S14	70	3.1
T22N, R10E S28	70	3.1
T21N, R10E S16	120	5.4
	690	30.4

FY 1995

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E S24	140	6.3
T21N, R9E S4	70	3.1
T21N, R9 S10	120	5.4
T21N, R9E S14	210	9.4
T21N, R9E S24	33	1.4
T21N, R10E S10	160	7.2
T21N, R10E S20	100	4.5
	838	37.3

FY 1996

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S2	220	9.9
T21N, R10 E S36	40	1.8
T22N, R10E S34	240	10.8
T21N, R10 E S6	150	6.7
	650	29.2

FY 1997

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R9E S36	100	4.5
T21N R10E S4	100	4.5
T21N, R10E S18	180	8.1
T21N, R9E S12	200	9.0
	580	26.1

FY 1998

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R10E S36	80	3.6
T21N, R10E S22	120	5.4
	200	10.0

FY 1999

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S12	240	10.8
T21N, R10E S14	240	10.8
T21N, R11E S6	240	10.8
	720	32.4

FY 2000

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R9E S8	52	2.3
T21N R10E S24	160	7.2
T21N, R11E S8	40	1.8
T21N, R11E S18	200	9.0
	452	20.3

FY 2001

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S8	40	1.8

FY 2002

No Volume

FY 2003

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R9E S24	100	4.5
T22N, R10E S30	120	5.4
	220	9.9

FY 2004

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E S14	150	6.7
T22N R8E S26	120	5.4
T21N, R10E S16	80	3.6
	350	15.7

FY 2005

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E S24	130	5.8
T21N, R9E S14	150	6.7
T21N, R10E S2	180	8.1
T21N, R10E S10	80	3.6
	540	24.2

FY 2006

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R10E S34	260	11.7
T21N, R10E S6	40	1.8
	300	13.5

FY 2007

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S18	156	7.0

FY 2008

Legal Description	Acres Harvested	MMBF Volume Harvested
NO VOLUME		

FY 2009

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S12	90	4.0
T21N, R10E S14	120	5.4
T21N, R11E S6	80	3.6
	290	13.0

FY 2010

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S24	140	6.3

FY 2014

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E S14	80	3.6
TOTAL	10691	481.0

ALTERNATIVE D

Cedar River Cutout utilizing 80 and 120 acre Clearcuts with adjacent Clearcutting allowed again after 3 year certification.

FY 1984

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S14	162	8.8
T22N, R9E		
S10	111	4.0
S14	10	.9
T22N, R10E		
S28	17	.8
T21N, R10E		
S10	28	1.8
S12	52	2.4
T21N, R10E		
S8	36	1.6
S18	37	1.7
	453	22.0

FY 1985

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S24	238	10.5
S14	40	1.8

FY 1985 Continued

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R10E		
S34	93	3.8
S36	48	1.9
T21N, R9E		
S4	80	3.6
S10	54	2.4
T21N, R10E		
S2	12	.5
T21N, R11E		
S6	163	6.4
S30	50	2.2
	778	33.1

FY 1986

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R9E		
S12	200	9.0
T22N, R10E		
S22	115	5.2
T21N, R10E		
S6	160	7.2
	475	21.4

FY 1987

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R9E		
S36	240	10.8

FY 1987 Continued

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S4	100	4.5
T21N, R10E S18	104	4.7
	444	20.0

FY 1988

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S22	280	12.6
T22N, R10E S36	120	5.4
	400	18.0

FY 1989

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S14	240	10.8
T21N, R10E S12	250	11.2
T21N, R11E S6	240	10.8
	730	32.8

FY 1990

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E S26	120	5.4
T21N, R11E S8	80	3.6
T21N, R11E S18	240	10.8
T21N, R11E S30	50	2.2
T21N, R10E S24	160	7.2
T22N, R8E S14	84	3.8
	734	33.0

FY 1991

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E S24	140	6.3
T22N, R8E S36	60	2.7
T21N, R9E S4	70	3.1
T21N, R9E S8	100	4.5
T22N, R9E S10	100	4.5
T22N, R9E S14	70	3.1
T22N, R9E S24	100	4.5
T22N, R10E S28	70	3.1
T21N, R9E S16	60	2.7
	770	34.5

FY 1992

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R10E S34	240	10.5
T21N, R9E S10	153	5.4
T21N, R9E S14	210	9.4
T21N, R9E S24	33	1.5
T22N, R10E S30	120	5.4
	756	32.2

FY 1993

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S10	160	7.2
T21N, R10E S8	100	4.5
T21N, R10E S2	220	9.9
T21N, R9E S22	110	4.9
	590	26.5

FY 1994

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S10	120	5.4
T21N, R10E S20	100	4.5
T21N, R10E S28	30	1.3
T21N, R10E S36	40	1.8
T22N, R10E S36	80	3.6
T21N, R10E S18	180	8.1
T21N, R10E S6	150	6.7
T21N, R10E S4	100	4.5
	800	35.9

FY 1995

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R9E S36	100	4.5
T21N, R9E S12	200	9.0
T21N, R11E S6	273	10.8
T21N, R10E S14	240	10.8
	813	35.1

FY 1996

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E S14	150	6.7
T21N, R10E S22	120	5.4
T21N, R11E S8	40	1.8
T22N, R8E S26	120	5.4
T21N, R10E S12	240	10.8
	670	34.1

FY 1997

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R11E S18	200	9.0
T22N, R8E S24	130	5.8
T21N, R10E S24	160	7.2
	490	22.0

FY 1998

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R9E S24	100	4.5
T22N, R10E S30	120	5.4
T21N, R9E S8	52	2.4
	272	12.3

A ud

FY 1999

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R9E S14	150	6.7
T21N, R10E S2	180	8.1
T21N, R10E S8	60	2.7
T21N, R10E S10	80	3.6
T22N, R10E S34	260	11.7
	730	32.8

FY 2000

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S16	80	3.6
T21N, R10E S18	156	7.0
T21N, R10E S6	40	1.8
	276	12.4

FY 2001

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R11E S6	80	3.6
T21N, R10E S14	120	5.4
	200	9.0

FY 2002

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E S14	80	3.6
T21N, R10E S12	90	4.0
	170	7.6

FY 2003

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S24	140	6.3
TOTAL	10691	481.0

ALTERNATIVE E

Cedar River Cutout utilizing the planned Forest Service programed harvest in the Watershed: 20 MMBF 1984-88: 33MMBF 1989-93; and 35 MMBF 1994 through Cutout.

FY 1984

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S14	162	8.8
T22N, R9E		
S10	111	4.0
S14	10	.9
T22N, R10E		
S28	17	.8
T21N, R10E		
S10	28	1.8
S12	52	2.4
T21N, R10E		
S8	36	1.6
S18	37	1.7
	453	22.0

FY 1985

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S24	238	10.5
T22N, R10E		
S34	93	3.8
S36	48	1.9

FY 1985 Continued

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R9E		
S4	80	3.6
S10	54	2.4
T21N, R10E		
S2	12	.5
T21N, R11E		
S6	163	6.4
S30	50	2.2
	778	33.1

FY 1986

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R9E		
S12	400	18.0
T21N, R10E		
S18	44	2.0
	444	20.0

FY 1987

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E		
S18	396	17.8
T22N, R10E		
S34	48	2.2
	444	20.0

FY 1988

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R10E S34	452	20.0

FY 1989

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S2	400	18.0
T22N, R9E S36	340	15.3
	740	33.3

FY 1990

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E S12	580	26.1
T21N, R9E S8	152	6.8
	732	32.9

FY 1991

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E		
S14	600	27.0
S20	100	4.5
S28	30	1.4
	730	32.9

FY 1992

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E		
S24	460	20.7
S36	40	1.8
T21N, R9E		
S24	33	1.5
T21N, R10E		
S24	200	9.0
	733	33.0

FY 1993

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R10E		
S10	240	10.8
T22N, R8E		
S14	380	17.1
T21N, R9E		
S22	110	5.0
	730	32.9

FY 1994

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R11E		
S6	560	25.2
T22N, R9E		
S10	100	4.5
T21N, R9E		
S10	120	5.4
	780	35.1

FY 1995

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R10E		
S30	240	10.8
T21N, R10E		
S22	400	18.0
T21N, R9E		
S14	70	3.2
T22N, R8E		
S36	60	2.7
S24	10	.4
	780	35.1

FY 1996

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S24	260	11.7
T21N, R10E		
S6	350	15.8
T22N, R10E		
S32	115	5.2
T21N, R9E		
S16	60	2.7
	785	35.4

FY 1997

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R11E		
S18	440	19.8
S30	50	11.2
T22N, R10E		
S28	70	3.2
S36	200	9.0
	760	33.2

FY 1998

Legal Description	Acres Harvested	MMBF Volume Harvested
T22N, R8E		
S26	240	10.8
T21N, R9E		
S14	360	16.2
T21N, R10E		
S8	160	7.2
	760	34.2

FY 1999

Legal Description	Acres Harvested	MMBF Volume Harvested
T21N, R9E		
S4	70	3.2
T21N, R10E		
S4	200	9.0
S16	200	9.0
T21N, R11E		
S8	120	5.4
	590	26.6

TOTAL	10691	480